

CLAIMS

1. A hydro-pneumatic mechanic device for the exploitation of the wave motion for obtaining renewable and ecological energy, *characterized in* a series of submerged cylinders placed onto wharfs fixed to the ground or onto floating pontoons or similar, provided in their lower part with a conical opening for the water inlet and in their upper part with conical, spherical or plain shapes with lateral openings, for respectively producing compressed air, pumping water or generating mechanic energy,
5 comprising:
 - a sluice-gate (1), hand operated, for closing the passage of the air from the cylinder to the collection and distribution system, so as to be able to act in case of servicing;
 - a plurality of filters (2) placed on the air inlet pipes;
- 10 - unidirectional valves (3) which allow the inlet of the air into the cylinder, but not the outlet;
- a unidirectional valve (4) which allows the passage of the air from the cylinder to the collection and distribution system, but not the inverse passage;
- 15 - a body (5) of the cylinder;
- a cone (6) for the inlet to the cylinder, which determines an increase of the water inside said cylinder according to its width and length;
- 20 - a floating piston (7) with a semispheric head which, pushed by the water, compresses the air onto the semispheric head of the cylinder;

- a plurality of bands (8) for sealing the floating piston,
so that the water entering said cylinder (5) due to the wave
motion from the inlet cone (6), pushes said piston (7) towards
the spherical head of said cylinder so that the air inside will get
5 compressed towards the outlet of said cylinder, opening the
unidirectional valve (4) and transferring the air towards the
collection and distribution system, and when the wave lowers,
said piston is called back downwards and said valve (4) closes,
thus preventing the outlet of the collected air, and valves (3)
10 open favouring the inlet of fresh air cleaned by filters (2), inside
said cylinder, the sealing whereof is guaranteed by said bands
(8) on the piston.

2. A device according to claim 1, of the kind with a conical head for
15 the production of compressed air, *characterized in:*
- a floating shpere (11) for closing the water inlet, so as to
allow the sole inlet of air;
- a cage (12) for the sealing of said shpere,
so that the water of the wave motion enters said cylinder (5)
20 from said inlet cone (6) receiving a pressure that pushes the air
in the cylinder towards said conical head and opening said valve
(4) so as to send the air towards the collection and distribution
system; when the water has reached the uppermost point of said
cone, the floating shpere (11) closes the outlet of said cylinder,
25 blocking a renewed rise; when the wave lowers, the depression
closes said valve (4), avoiding the outlet of the collected air, and

said valves (3) open, favouring the inlet of fresh air cleaned in said cylinder.

3. A device according to claim 1, of the kind with a conical head for
5 the production of compressed air, *characterized in:*
- a floating shpere (11) for closing the water inlet, so as to allow the sole inlet of air;
 - a cage (12) for the sealing of said shpere,
- so that the water of the wave motion enters said cylinder (5)
10 from said inlet cone (6) receiving a pressure that pushes the air in the cylinder towards said conical head and opening said valve (4) so as to send the air towards the collection and distribution system; when the water has reached the uppermost point of said cone, the floating shpere (11) closes the outlet of said cylinder,
15 blocking a renewed rise; when the wave lowers, the depression closes said valve (4), avoiding the outlet of the collected air, and said valves (3) open, favouring the inlet of fresh air cleaned in said cylinder.

- 20 4. A device according to claim 1, *characterized in that* the reservoirs (13) are placed below the sea level and that they are filled due to the phenomenon of the communicating vessels and that air, compressed at a pressure necessary to the water outlet through a pipe that will serve the users or the electric turbines, is let in, while when the water level is near to nul, the level gauge
25 (14) inside the reservoir sends a signal to an electronic panel

(15) for the control of the closing of the valve (16) of the water for the users and of the valve (17) for the inlet of compressed air and, at the same time, it opens valves (16) and valve (17) for the inlet of compressed air in the next reservoir (13), so that while the reservoir is working, the central panel will contemporarily open the exhaust valve (18) and valve (19) for filling said reservoir (13) and when the latter is filled again, the level gauge (14) will send a new closing signal to said valves (16 and 17).

10 5. A device according to claims 1 and 4, *characterized in that* with two reservoirs 13, and adjusting the opening diameter for the water inlet and outlet, a continuous cycle for the water distribution is obtained, emptying one reservoir while filling the other.

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6. A device according to claim 1, of the kind for transforming the wave motion into mechanic energy, *characterized in:*

- a floating piston (20);
- a toothed rod (21) for the transmission of the movement to the gearing;
- a guide (22) for the sliding of the transmission shaft;
- a plurality of supports (23) for the guide of the shaft;
- a unidirectional gear (24) for each ascending phase;
- a unidirectional gear (25) for each descending phase;
- a plurality of outlet openings (26) for excess water;

- a plurality of shafts (27) for the distribution of the mechanical motion;
- a differential (28);
- one or more users (29);
- 5 - a gear (30) for the transmission of the transmission shafts;
- a plurality of grills (31) for the water outlet;
- a plurality of grills (32) for water drainage.

7. A device according to claims 1 and 6, *characterized in* a floating piston 20 comprising:

- a hemispherical floating bottom (33);
- a plurality of sealing bands (34);
- a plurality of shock absorbing elements (35);
- a head (36).

15 8. A device according to claim 1, *characterized in* an end of stroke device for shaft (21) comprising:

- a ring (37) for the end of the stroke of the sliding guide (22);
- a shock absorbing system (38);
- 20 - a ring (39) for sealing the shock absorbing system.

9. A device according to claim 1, *characterized in* a means for collecting the motion of the distribution shafts (27) for transferring the same to said differential (28), comprising:

- 25 - a pair of unidirectional gears (24') and (25');
- shafts (27) for the distribution of the motion;

- a gear (30) for the transmission of the motion of the shafts to the differential.

10. A device according to claims 1 and 9, *characterized in* a series
5 of cylinders so that, when the wave passes, the water enters the cylinder from the inlet cone (6) and receives such a pressure as to push upwards said piston (20) connected to a toothed rod (21) which operates gears (24), and when the wave lowers, it creates a depression such as to suck the piston downwards
10 while in its descending phase, the toothed rod (21) operates said gear (25) and the motion is transmitted from said rod (21) to said distribution shafts (27) so that, when the rod rises, the gear (24) puts into rotation its distribution shaft while gear (25) turns idle, without operating its own shaft (27), and when shaft
15 (21) comes down, the inverse happens and the gear (25) puts into rotation its own distribution shaft (27), while gear (24) turns idle; the movement of the two shafts (27) is transformed into one single direction by said gear (30) and transmitted to said differential (28).

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11. A device according to claim 1, *characterized in* a shock absorbing means for absorbing violent pushes and opening discharge openings (26) for the water and, when the wave lowers, pushing said piston (20) downwards for closing the
25 openings so that the depression inside the cylinder drags with force the piston to the ground.

12. A device according to claims 1 and 11, *characterized in* an end of stroke means, provided with a shock absorbing means for absorbing the violent pushes of the waves.

5 13. A device according to claim 1, of the kind with a plain head for the production of compressed air, *characterized in* an increased number of unidirectional valves (3) for favouring the inlet of the air into said cylinder (5), inside which a floating piston (40) is housed with cylindrical shape, provided with sealing bands e
10 with a flexible gasket (42), fixed to its upper part by means of a blocking plate (43) with screw bolts (44) for preventing the forming, inside said cylinder (5), of air bags reducing the efficiency.